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EXAMINER

ANGWIN, DAVID PATRICK

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ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

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DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. §112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 8-28 and 31 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically:

a. **Claim 8** recites the following limitations that are vague, indefinite, and confusing:

- “a wafer positioning device for positioning a wafer with chips surfaces thereof extending in a first plane having a front face and a back face” (claim 8, lines 3-5) – It is unclear as to whether the “wafer positioning device,” the “chips surfaces,” or the “first plane” has “a front face and a back face.” This language can be interpreted multiple ways. The examiner recommends language such as, “a wafer positioning device for positioning a wafer, the wafer with chips surfaces therefore extending in a first plane, the first plane having a front face and a back face.” However, this is just one interpretation of the language. Please be more precise with the claim language.
- “a lead frame positioning device for positioning a lead frame with a bond surface thereof extending in a second plane...” (claim 8, lines 6-8) - It is unclear as to whether the “device” or the “lead frame” is “with a bond surface.” This language can be interpreted in multiple ways. If the examiner is interpreting the applicant's invention properly, the examiner recommends language such as, “a lead frame positioning device for positioning a lead frame, the lead frame having a bond surface, the bond surface extending...” Please be more precise with the claim language.

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- “a lead frame positioning device for positioning a lead frame with a bond surface thereof extending in a second plane...” (claim 8, lines 6-8) - It is unclear as to whether the "lead frame positioning device," the "lead frame," or the “bond surface” is “extending in a second plane.” This language can be interpreted in multiple ways. Please be more precise with the claim language;
- “the axis of rotation extending in a third plane, the third plane being both equidistant to and between the front faces of the first and second planes” (claim 8, lines 23-24) – It is unclear how an axis, a line, forms a plane. There are an infinite number of planes that can be formed through an axis. Please be more precise with the claim language.
- “the axis of rotation extending in a third plane, the third plane being both equidistant to and between the front faces of the first and second planes” (claim 8, lines 23-24) - It is unclear as to what part of the third plane that intersects both the first and second planes must be “equidistant to... the first and second planes. Please be more precise with the claim language.

Claim Rejections - 35 USC § 102

The following is a quotation from 35 U.S.C. §102 that forms the basis for the rejections under this section made in this Office Action:

- (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 8 (alternatively) and 9-28 and 31, as best understood, are rejected under 35 U.S.C. § 102(b) as being anticipated by *Wirz et al* (US Patent 6,171,049).

- a. *Wirz et al* discloses the following in his reference:
- i. a wafer-positioning device for positioning a wafer with chips surfaces thereof extending in a first plane having a front and a back face, the chips surfaces exposed on the front face of the first plane (Fig. 1, item 28);

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- ii. a lead frame positioning device (Fig. 1, items 29 and 30) for positioning a lead frame with a bond surface thereof extending in a second plane which is different from the first plane, the second plane having a front face and a back face, the bond surface exposed on the front face of the second plane, the front face of the second plane facing the front face of the first plane, either parallel (180 degrees) or intersecting at an intersection line to form a dihedral angle of greater than 0 degrees and less than 180 degrees (Fig. 1);
- iii. a rotatable transfer assembly (Fig. 1, items 24, 25, and 26) comprising at least two transfer heads (Fig. 1, items 7 and 8) for picking up a first chip from the wafer by a first transfer head in a chip pick-up position, while bonding a second chip to the lead frame by another one of the transfer heads in a chip bonding position, while bonding a second chip to the lead frame by another one of the transfer heads in a chip bonding position; rotating the first chip by the first transfer head from the chip pick-up position to the chip bonding position; and bonding the first chip to the lead frame by the first transfer head in the chip bonding position, while picking up a third chip from the wafer by another one of the transfer heads in the chip pick-up position;
- iv. a transfer assembly motor for driving the rotatable transfer assembly about an axis of rotation, the axis of rotation extending in a third plane, the third plane being both equidistant to and between the front faces of the first and second planes (Fig. 1; *the examiner notes that the axis rotation motion forms a plane itself; in the alternative, an infinite number of planes go through the axis of rotation and both the first and second planes*);
- v. a transfer assembly motor for driving the rotatable transfer assembly about an axis of rotation which extends in a third plane at half of first angle to the first plane and the second plane, respectively, and the axis of rotation extending at a second angle of at least 0 degrees and at most 90 degrees to said intersection line (Fig. 1, item 24; 4:24-29);

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- vi. the transfer heads are rotatable essentially along one circle in a fourth plane at right angles to the axis of rotation of the transfer assembly (Figs. 1 and 7a-8d);
- vii. the transfer heads are spaced regularly along said circle (Fig. 1);
- viii. the dihedral angle is 90 degrees (Fig. 1);
- ix. the offset angle is 0 degrees (Fig. 1; *the examiner notes the axis of rotation of item 24 and the line of intersection of the first and second planes are at an angle of 0 degrees*);
- x. the transfer assembly is rotated in one direction (Fig. 8a-8c; *the examiner notes that the transfer assembly is rotated in one direction during the pick-up and bonding portions*); and
- xi. each transfer head comprises a collet which, in the chip pick-up position, is movable in a direction essentially at right angles to the first plane, and in the chip bonding position, is movable in a direction essentially at right angles to the second plane (Fig. 1);
- xii. the transfer assembly comprises a counterweight for each collet, each collet being coupled to its corresponding counterweight through a mechanical coupling for compensating radial forces exerted on the collet relative to said axis of rotation (Fig. 1; *the examiner notes that each transfer arm acts as a counterweight against the other transfer arm for vibrational and design purposes*);
- xiii. the mechanical coupling is adapted to be driven by a collet drive motor for moving the collet radially relative to said axis of rotation (Figs. 1-2, item 13; 2:54-58);
- xiv. the transfer assembly motor has the same axis of rotation as the collet drive motor (Fig. 1-8; *the examiner notes that in certain positions these items have the same axis of rotation*);

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- xv. the counterweight for one collet is another collet of the transfer assembly (Figs. 1-8);
- xvi. one collet is situated oppositely relative to said other collet with respect to said axis of rotation (Figs. 1-8);
- xvii. the mechanical coupling is a wire (Figs. 1-8);
- xviii. a narrow gap between the rotatable transfer assembly and the transfer assembly motor and the transfer assembly motor comprising groove sections facing the gap for at least the chip pick-up position and the chip bonding position (Figs. 1-8); and
- xix. the two front faces intersect at the intersection line, the third plane bisects the dihedral angle, and the axis of rotation is at an offset angle of at least 0 degrees and at most 90 degrees with respect to the intersection line (Figs. 1-8).

Claim Rejections – 35 USC § 103

The following is a quotation of 35 U.S.C. § 103(a) that forms the basis for all obviousness rejections set forth in this Office action:

- (a) A patent may not be obtained though the invention is not identically taught or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. § 103(a) are summarized as follows:

- 1. Determining the scope and contents of the prior art.
- 2. Ascertaining the differences between the prior art and the claims at issue.
- 3. Resolving the level of ordinary skill in the pertinent art.
- 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 8-28 and 31, as best understood, are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Wirz et al* (US Patent 6,171,049) in view of *Hineno et al* (US Patent 4,653,664).

- a. Regarding claim 8, in the alternative, in addition to the above limitations, *Wirz et al* may not expressly disclose in his reference a transfer assembly drive motor.
 - i. However, *Hineno et al* teaches using a transfer assembly drive motor (Fig. 1; 5:38). The advantage of using a motor to drive the transfer assembly is to utilize a well known technology to power the rotational motion of a chip assembly device. Thus, it would have been obvious to utilize a transfer assembly drive motor to utilize a well known technology to power the rotational motion of a chip assembly device.
- b. Regarding claim 13, in addition to the limitations in claim 8, *Wirz et al* may not expressly disclose in his reference that the number of transfer heads is four.
 - i. However, *Hineno et al* teaches that the number of transfer head is four. The advantage of using four transfer heads is to manufacture more efficiently. Thus, it would have been obvious to use four transfer heads to manufacture more efficiently.
- c. Regarding claim 16, in the alternative, in addition to the limitations in claim 15, *Wirz et al* may not expressly disclose in his reference that each transfer head comprises a collet.
 - i. However, *Hineno et al* teaches that each transfer head comprises a collet, counterweight, and collet drive motor (Fig. 5). The

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advantage of using a collet, counterweight, and collet drive motor is to efficiently and effectively pick-up and replace chips. Thus, it would have been obvious to use a collet, counterweight, and collet drive motor to efficiently and effectively pick-up and replace chips.

- d. Regarding claim 16, in addition to the limitations in claim 15, *Wirz et al* may not expressly disclose in his reference that the transfer assembly has counterweights to compensate for radial forces.
 - i. However, *Hineno et al* teaches transfer arms placed symmetrically around the axis rotation (Fig. 1). The advantage of symmetry is to design for opposing forces. Therefore, it would have been obvious to make symmetry to design for opposing forces.
- e. Regarding claim 17, in the alternative, in addition to the limitations in claim 17, *Wirz et al* may not expressly disclose in his reference that the devices are moved radially with respect to the axis of rotation.
 - i. However, *Hineno et al* teaches picking up and placing back down a component (Fig. 1). The advantage of picking up and placing a component is to effectively move the component from the wafer to the lead frame. The advantage of symmetry is to design for opposing forces. Therefore, it would have been obvious to move the devices radially to pick up and place a component and effectively move the component from the wafer to the lead frame.
- f. Regarding claims 22-24, in addition to the limitations in claim 21, *Wirz et al* may not expressly disclose in his reference that the transfer assembly motor has the same axis of rotation as the collet drive motor, the counterweight is another collet, one collet is opposite another collet, the mechanical coupling is a wire, a low-stiffness spring supports each collet, and the pretension force is greater than a bonding force on the chip.

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- i. However, the applicant has not disclosed that these limitations solve any stated problem or provide any unexpected results. Specifically, the applicant, in his specification, does not cite any substantial benefit over current technology to adding these limitations. As such, the examiner considers these limitations to be a design choice. Therefore, it would have been obvious as a matter of design choice to modify *Wirz et al* as already modified by *Hineno et al* by including these limitations because these limitations do not solve any stated problem or provide any unexpected results, and it appears the chip transfer apparatus would perform equally well while not including these limitations.
- g. Regarding claim 25, in addition to the limitations in claim 8, *Wirz et al* may not expressly disclose in his reference that the transfer assembly rotates around a stator.
- i. However, *Hineno et al* discloses in his reference driving the transfer assembly with a motor (5:38). The advantage of using a motor to drive the transfer assembly is to provide rotational motion to it by a well known and reliable device. Thus, it would have been obvious to rotate the transfer assembly around an electric motor to provide rotational motion to it by a well known and reliable device. (The examiner and the applicant both know that electric motors are known to have stators.)
- h. Regarding claims 26-28, in addition to the limitations in claim 25, *Wirz et al* may not expressly disclose in his reference that the number of groove sections is equal to the number of transfer sections, each first duct has a control valve, and the second gas duct is provided with a bridging groove.
- i. However, the applicant has not disclosed that these limitations solve any stated problem or provide any unexpected results. Specifically, the applicant, in his specification, does not cite any substantial benefit over current technology to adding these limitations. As such, the examiner considers these limitations to be a design choice. Therefore, it would have been obvious as a matter of design choice to modify *Wirz et al* as already modified by

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Hineno et al by including these limitations because these limitations do not solve any stated problem or provide any unexpected results, and it appears the chip transfer apparatus would perform equally well while not including these limitations.

Response to Arguments

First, regarding claim 8, the applicant argues that the references do not teach "a system where pick-up (from the wafer) and bonding (to the lead frame) take place concurrently" (applicant's arguments, 8:15-16). However, it is noted that the features upon which applicant relies (i.e., timing of pick-up and bonding) are not recited in the rejected claims. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Therefore, the examiner maintains the rejection.

Second, regarding claim 9, the applicant argues that the references do not teach that "the transfer heads are rotatable essentially along one circle in a fourth plane at right angles to the axis of rotation of the transfer assembly" (applicant's arguments, 9:13-15). However, the examiner disagrees. *Wirz et al* (Figs. 1-8) show a chip held by a collet. That chip can rotate in a plane that is at right angles to the axis of rotation of the transfer assembly (See Figs. 3-4 and 7a-d; *the examiner notes that one interpretation of many is that the drawing shows an arc perpendicular to the axis of rotation of the transfer assembly*). Therefore, the examiner maintains the rejection.

Third, regarding claim 10, the applicant argues that the references do not teach that "the transfer heads are spaced regularly along said circle" (applicant's arguments,

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5-6). However, the examiner disagrees. Regular spacing can mean, among other things, that a spacing is normal or expected for the given apparatus. Please be more specific with the claim language. Therefore, the examiner maintains the rejection.

Fourth, regarding claim 14, the applicant argues that the references do not teach rotation in one direction. However, the examiner disagrees. The references teach rotation in one direction among several directions of rotation. Therefore, the examiner maintains the rejection.

Fifth, regarding claim 15, the applicant argues that the references do not teach that each transfer head has a collet that, in the pick-up position, is movable at right angles to the first plane, and in the bonding position, is movable at right angles to the second plane. However, the examiner disagrees. *Wirz et al* discloses that a chip is lifted, then moved perpendicular to the first surface, then brought close to the second plane, moved perpendicular to that surface, the bonded. Therefore, the examiner maintains the rejection.

Sixth, regarding claim 16, the applicant argues that the references do not disclose a counterweight. However, the examiner disagrees. *Hineno et al* shows opposing arms (Fig. 1). The movement of these arms can counter the other. Symmetry and counterforces are well known design features. Therefore, the examiner maintains the rejection.

Seventh, regarding claim 17, the applicant argues that the references do not disclose radial movement relative to the axis of rotation. However, these devices are

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well known to provide radial movement to pick up and place the components. The rejection is maintained.

Eighth, regarding claim 25, the applicant argues that it would not have been obvious to utilize an electric motor containing a stator. However, the examiner disagrees because stators are well known to be utilized in electric motors.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David P. Angwin, whose telephone number is (571) 270-3735. The examiner can normally be reached on 7:30 AM - 5 PM (M-F).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Bryant, can be reached on 571-272-4526. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/A. Dexter Tugbang/
Primary Examiner
Art Unit 3729

DPA

January 16, 2009